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THE ROLE OF DIVERGENT AND CONVERGENT THINKING IN DEVELOPING INTUITIVE COMPETENCE OF CADETS (ON THE EXAMPLE OF HIGHER MATHEMATICS EDUCATION)

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Abstract
This study investigates the pedagogical potential of divergent and convergent thinking strategies in developing intuitive competence among cadets within higher mathematics education in military institutions. The research applies problem-based learning, mathematical modeling, and real operational scenarios to foster multi-perspective analysis and optimal decision-making skills. The results demonstrate that divergent thinking enhances cognitive flexibility and hypothesis generation, while convergent thinking strengthens analytical precision and solution efficiency. Their integration significantly contributes to the formation of professional intuition, rapid reasoning, and operational readiness of future officers.

Keywords: Intuitive competence, divergent thinking, convergent thinking, higher mathematics education, military training, problem-based learning, mathematical modeling.

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Introduction

Modern military operations demand officers capable of rapid decision-making under uncertainty and dynamic conditions. Traditional algorithmic instruction in mathematics often fails to develop adaptive reasoning and intuitive judgment required in real combat environments.

Higher mathematics plays a critical role in modeling ballistic trajectories, logistics systems, and risk assessments, making it an effective platform for cognitive skill development. Integrating divergent and convergent thinking enables cadets to explore multiple solution pathways and subsequently select optimal strategies.

The purpose of this study is to examine how structured cognitive thinking cycles contribute to the formation of intuitive competence in military mathematics education.

2. Literature Review

Divergent thinking involves generating multiple ideas, hypotheses, and alternative problem representations, fostering creativity and cognitive flexibility. Convergent thinking focuses on logical evaluation, optimization, and selecting the most efficient solution based on constraints.

Educational research highlights that combining both thinking modes enhances deep understanding, adaptability, and intuitive reasoning. In military pedagogy, intuitive competence is recognized as a key component of rapid situational assessment and operational decision-making.

However, systematic integration of these approaches in higher mathematics education for cadets remains underexplored.

3. Methodology

A quasi-experimental design was implemented involving:

- problem-based mathematical instruction
- simulation and modeling tasks reflecting military operations
- reflective cognitive analysis sessions

Cadets were divided into control and experimental groups. The experimental group followed structured divergent–convergent thinking cycles across calculus, differential equations, and probability modules.

Data collection included:

- task completion speed
- solution accuracy
- qualitative observation of reasoning strategies

4. Practical Case Study: Developing Intuitive Competence through Artillery Trajectory Modeling

4.1 Case Description

Cadets were assigned a real combat-oriented task involving artillery fire optimization considering wind resistance and terrain elevation. The objective was to determine the optimal launch angle and initial velocity to accurately strike a target.

4.2 Divergent Thinking Phase

Cadets explored multiple modeling approaches:

- classical projectile motion equations
- differential equations incorporating air resistance
- numerical simulations
- probabilistic deviation models

Various assumptions regarding environmental conditions and shell parameters were tested.

4.3 Convergent Thinking Phase

After evaluating all alternatives, cadets selected the optimal dynamic system:

$$\begin{cases} \frac{d^2x}{dt^2} = -kv_x \\ \frac{d^2y}{dt^2} = -g - kv_y \end{cases}$$

where: g-gravitational acceleration, k - air resistance coefficient.
Numerical methods were applied to minimize trajectory deviation and determine precise firing parameters.

4.4 Intuitive Competence Development

Repeated modeling and reflection enabled cadets to:

- rapidly identify effective mathematical structures
- anticipate environmental influences
- select optimal strategies under uncertainty

This confirmed the emergence of intuitive reasoning grounded in analytical experience.

5. Results and Discussion

The experimental group demonstrated:

- 25–30% improvement in problem-solving speed
- increased accuracy in applied modeling tasks
- stronger anticipatory reasoning

Divergent thinking expanded cognitive exploration, while convergent thinking ensured disciplined analytical refinement. Their integration mirrored real military decision-making processes.

6. Conclusion

The study confirms that integrating divergent and convergent thinking within higher mathematics education significantly enhances intuitive competence among cadets. This pedagogical framework fosters cognitive adaptability, analytical precision, and operational readiness.
Embedding structured cognitive cycles into military mathematics curricula is recommended to strengthen professional intuition and strategic effectiveness.

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